

國立暨南國際大學九十二學年度轉學生入學考試試題

第 3 節普通物理適用：(土木系二 322)

(本試題共 / 頁，第 / 頁)

考生注意：1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分，並限以藍黑色筆作答。
3. 試題隨卷繳回。(餘詳詳閱試場規則)

(1) State the follows: (a) conservative force, (b) resonance, (c) the second law of thermodynamics, (d) dipole, (e) rotational inertia, (f) ideal gases, (g) LC oscillation, (h) uncertainty principle. (40%)

(2) Two cylinders having radii R_1 and R_2 and rotational inertias I_1 and I_2 , respectively, are supported by axes perpendicular to the plane of Fig. 2. The large cylinder is initially rotating with angular velocity ω_0 . The small cylinder is moved to the right until it touches the large cylinder and is caused to rotate by the frictional force between the two. Eventually, slipping ceases, and the two cylinders rotate at constant rates in opposite directions. (a) Find the final angular velocity ω_2 of the small cylinder in term of I_1 , I_2 , R_1 , R_2 , and ω_0 . (b) Is total angular momentum conserved in this case? (12%)

(3) An inventor claims to have constructed an engine that has an efficiency of 75% when operated between the boiling and freezing points of water. Is that possible? (12%)

(4) A ball is attached to a horizontal cord of length L whose other end is fixed, Fig. 4. (a) If the ball is released, what will be its speed at the lowest point of its path? (b) A peg is located a distance h directly below the point of attachment of the cord. If $h = 0.8L$, what will be the speed of the ball when it reached the top of its circular path about the peg? (12%)

(5) In Fig. 5, the C_2 capacitor is initially charged to V and the C_1 capacitor is uncharged. With the condition $C_2 = 9C_1$, describe in detail how one might charge the C_1 capacitor to $3V$ by manipulating switches S_1 and S_2 . (12%)

(6) A proton of charge $+e$ and mass m enters a uniform magnetic field $\mathbf{B} = B\mathbf{e}_1$ with an initial velocity $\mathbf{V} = v_1\mathbf{e}_1 + v_2\mathbf{e}_2$. Find an expression in unit-vector notation for its velocity \mathbf{V} at any later time t . (12%)

